USER MANUAL

NIU5 (802.11 a/b/g/n 1x1 + BT5.0 IoT Combo Module)

WCBN3512A

Version 1.1

Change History

Revision	Date	Author	Change List
Version 1.0	2018/11/12	Ben J Chen	Preliminary
Version 1.1	2018/11/23	Ben J Chen	Update BT Function in Product Specifications Update Pin Assignment Update Label Drawing Update Module Photo Update Packing Drawing

DESCRIPTION

WCBN3512A is a single package wireless local area network(WLAN) and Bluetooth(BT) combo solution to support dual band 1x1 IEEE802.11 a/b/g/n WLAN standards and BT 5.0, thereby enabling seamless integration of WLAN and BT Low Energy technology.

PRODUCT FEATURES

WCBN3512A device contains three processors:

- The first processor, an ARM Cortex-M4F@ up to 128MHz is used as the application processor. It runs the Qualcomm network stack as well as OEM application code. Customer software runs under an RTOS such as ThreadX or FreeRTOS and so on.
- Second processor, an ARM Cortex-M0@64MHz, which is utilized as the connectivity processor for BLE subsystem
- Third processor, CPU which is a dedicated processor to run the Wi-Fi dual band function

Wireless:

- Bluetooth Low Energy (BLE) compliant to the SIG v5.0 specification
- Operate at ISM frequency Band (2.4/5GHz)
- IEEE Standards Support, 802.11a ,802.11b, 802.11g 802.11n
- Support 20 MHz channel width in 2.4GHz and 5GHz

Other Interface:

- Up to 2 of I^2C interface
- Up to 2 of high speed UART interface
- Up to 1 of SPI Master and 1of SPI Slave interface
- Up to 6 of Sensor ADC(up to 8 channels, 12bit, 1Msps) for sensor application
- Up to 6 of PWM optimized for LED lighting applications
- UP to 1 of SDIO2.0 slave interface
- I^2S, a rich set of programmable General Purpose IOs(GPIOs), JTAG debug port

Power Management:

- QCC721 implements an advanced power management scheme to minimize power dissipation for each use case.
- Fine-grain power island partitioning with aggressive power gating
- Dynamic Voltage and frequency Control
- Configurable memory retention for minimizing deep sleep power per application

PRODUCT SPECIFICATIONS

MAIN CHIPSET

Qualcomm Atheros QCC721

FUNCTIONAL SPECIFICATIONS

BT Function	
Standard	Bluetooth V5.0
Bus Interface	UART
Data Rate	1 Mbps, 2Mbps
Modulation Scheme	GFSK
Frequency Range	2.402~2.480 GHz
Transmit Output Power	-3 ≤ Output Power ≤ +2dBm; Class II Device
Receiver Sensitivity	< 0.1% BLE 1M at -94dBm

Wi-Fi Function	
Standard	IEEE802.11a; IEEE802.11b; IEEE 802.11g; IEEE 802.11n;
Bus Interface	UART
Data Rate	***802.11a:*** 54, 48, 36, 24, 18, 12, 9, 6 Mbps ***802.11b:*** 11, 5.5, 2, 1 Mbps ***802.11g:*** 54, 48, 36, 24, 18, 12, 9, 6 Mbps ***802.11n:*** MCS 0 to 7 for HT20MHz
Media Access Control	CSMA/CA with ACK
Modulation Technique	***802.11a***: 64QAM, 16QAM, QPSK, BPSK ***802.11b***: CCK, DQPSK, DBPSK ***802.11g***: 64QAM, 16QAM, QPSK, BPSK ***802.11n***: 64QAM, 16QAM, QPSK, BPSK
Network Architecture	Infrastructure mode
Operation Channel	***2.4GHz*** 11: (Ch. 1-11) – United States

	13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan ***5GHz*** 21: USA 19: EU 8: Japan
Frequency Range	***802.11bg*** 2.400 ~ 2.4835 GHz ***802.11a*** 5.15 ~ 5.85 GHz

Transmit Output Power - single chain @ant;
Tolerance: ±2dBm@2.4GHz; ±2.5dBm@5GHz

2.4GHz

802.11b	***1Mbps***	***2Mbps***	***5.5Mbps***	***11Mbps***
Tgtpwr (dBm)	16	16	16	16

802.11g	***6~24Mbps***	***36Mbps***	***48Mbps***	***54Mbps***
Tgtpwr (dBm)	16	16	16	16

802.11n HT20	***MCS0***	***MCS1***	***MCS2***	***MCS3***	***MCS4***
Tgtpwr (dBm)	16	16	16	16	16
	MCS5	***MCS6***	***MCS7***		
	16	16	16		

5GHz

802.11a	***6~24Mbps***	***36Mbps***	***48Mbps***	***54Mbps***
Tgtpwr (dBm)	13	13	12	11

802.11n HT20	***MCS0***	***MCS1***	***MCS2***	***MCS3***	***MCS4***
Tgtpwr (dBm)	13	13	13	13	12
	MCS5	***MCS6***	***MCS7***		
	11	10	9		

Receiver Sensitivity

Frequency Band	***Rate***	***Condition***	***1x1(1SS) (dBm)***
2.4G	11b-1M	PER < 8%	-89
	11b-11M	PER < 8%	-82
	11g-6M	PER < 10%	-87
	11g-54M	PER < 10%	-72
	11n-HT20MCS0	PER < 10%	-87
	11n-HT20MCS7	PER < 10%	-69

5G	11a-6M	PER < 10%	-87
	11a-54M	PER < 10%	-72
	11n-HT20MCS0	PER < 10%	-87
	11n-HT20MCS7	PER < 10%	-69
Security	WPS, WPA, WPA2, WEP 64bit & 128bit, IEEE 802.1X, IEEE 802.11i		

Common Function					
Operating Voltage	3.3 V ±5% I/O supply voltage				
Power Consumption	***Mode***	***Average***		***Peak***	
		2.4G	***5G***	***2.4G***	***5G***
	TX	*TBDmA*	*TBDmA*	*TBDmA*	*TBDmA*
	RX	*TBDmA*	*TBDmA*		
	Disable	*TBDmA*			
	Sleep mode	*TBDmA*			
Antenna Type	Printed Antenna for WiFi/BT				

RECOMMENDED OPERATION CONDITIONS

Symbol	Parameter	Min	Typ	Max	Units
SWREG_IN_WL VDD33_WL	WL Internal SWREG supply	3.14	3.3	3.46	V
VDD33_ANT_WL VDD33_RF_WL VDD33_XTAL_WL VDD33_PLL_WL VDD33_SYNTH_WL VDD33_USB_WL	WL Analog High Voltage supply	3.14	3.3	3.46	V
DVDD12_WL	WL Core Digital supply	1.2	1.26	1.32	V
VDD12_BB_PLL_WL VDD12_RF_WL VDD12_SYNTH_WL	WL Core Analog supply	1.2	1.26	1.32	V
V_{IH} MIN	Minimum Digital I/O input voltage for 3.3V I/O supply	-0.3	-	-	V
3.3V I/O V_{IH} MAX	Maximum Digital I/O input voltage for 3.3V I/O supply	-	-	V_{dd}+0.3	V

PIN ASSIGMENT

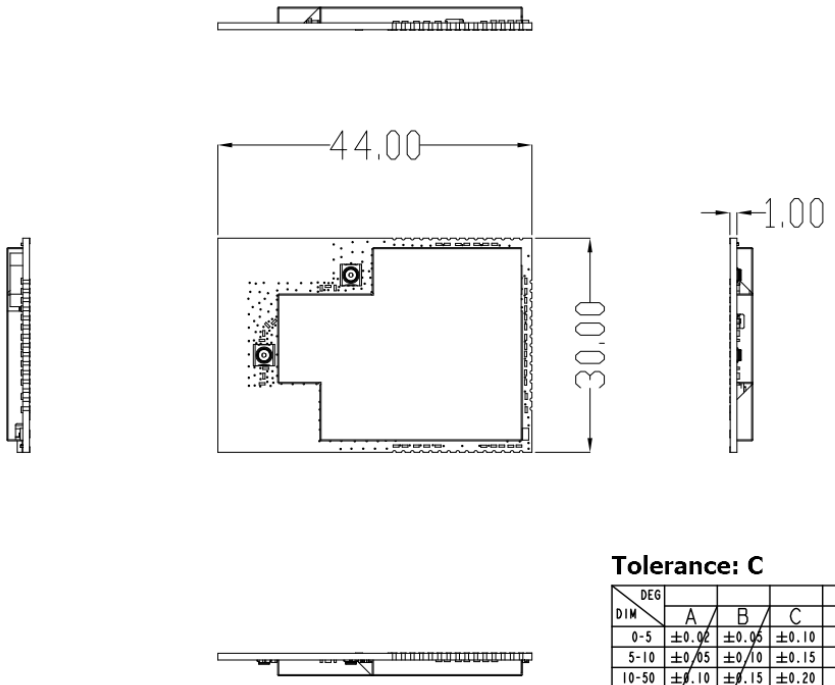
** The following signal type is defined:*

I: Input; O: Output; I/O: Input/Output; G: Ground

Pin.	Pin Define	I/O	Description	Status
1	GPIO55_BE / SPI_GPIO_OUT	O	Serial Data out	YES
2	GPIO24_BE / SPI_MASTER_CS_N	I/O	SPI Bus Master Chip select	NC
3	GPIO26_BE / SPI_MASTER_MOSI	I/O	SPI Bus Master Output / Slave Input	YES
4	GPIO25_BE / SPI_MASTER_CLK	I/O	SPI Bus Master Clock	YES
5	GPIO27_BE / SPI_MASTER_MISO	I/O	SPI Bus Master Input / Slave Output	YES
6	GPIO18_BE / JTAG ENABLE (RST IN)	G	JTAG_RST	YES
7	USB20_DM_BE / USB_DEVICE_DM	I/O	USB Data-	YES
8	USB20_DP_BE / USB_DEVICE_DP	I/O	USB Data+	YES
9	GPIO22_BE / DOWNLOD_SW_IMAGE (RST IN)	O		YES
10	CHIP_PWD_L_BE / RESET_N	I	M4 processor and BLE subsystem reset signal (Active low)	YES
11	GPIO32_BE / I2S_MCLK	I/O	I2S Continuous Serial Clock	YES
12	VDD33	I	3.3V power supply for QCC721	YES
13	VDD33	I	3.3V power supply for QCC721	YES
14	VDD33	I	3.3V power supply for QCC721	YES
15	VDD33	I	3.3V power supply for QCC721	YES
16	GPIO19_BE	I/O		YES
17	GPIO20_BE	I/O		YES
18	GPIO20_BE / SW_FUNCTION Mode	I		YES
19	GPIO29_BE / I2S_DATA_IN			NC
20	GPIO28_BE / I2S_BCLK			NC
21	GPIO31_BE / I2S_WS	I/O	I2S Word Select	YES
22	GPIO17_BE / HUART_RX	I	High Speed UART receive data	YES
23	GPIO10_BE / I2C_SCK	I	I2C Serial Clock input	YES
24	GPIO11_BE / I2C_SDA	I/O	I2C Serial data	YES
25	GPIO13_BE / I2C_RST			YES
26	GPIO16_BE / I2C MASTER SCL			YES
27	GPIO14_BE / GPIO14	I/O	Reserve for GPIO14	YES
28	GPIO9_BE /	O	UART transmit data for Debug	NC

	DEBUG_UART0_TX			
29	GPIO15_BE / HUART_TX	I/O	High Speed UART transmit data	YES
30	GPIO60_BE / GPIO60	I/O	Reserve for GPIO60	YES
31	GND	G	Ground	YES
32	GND	G	Ground	YES
33	GND	G	Ground	YES
34	GPIO48_BE / SPI_GPIO_IN	I		NC
35	GPIO8_BE / DEBUG_UART0_RX	I	UART receive data for Debug	NC
36	GPIO53_BE / JTAG_TDI	I	JTAG Test Data In	YES
37	GPIO52_BE / JTAG_TMS	I/O	JTAG Test Mode Select	YES
38	GPIO49_BE / JTAG_RST	I	JTAG Test Reset	YES
39	GPIO50_BE / JTAG_TCK	I	JTAG Test Clock	YES
40	GPIO51_BE / JTAG_TDO	O	JTAG Test Data Out	YES
41	GND	G	Ground	NC
42	GND	G	Ground	YES
43	GND	G	Ground	YES
44	GND	G	Ground	YES
45	GND	G	Ground	YES

MECHANICAL



Tolerance: C

DEG / DIM	A	B	C	D	ANGLE	
0-5	±0.02	±0.05	±0.10		0°-30°	±0.1°
5-10	±0.05	±0.10	±0.15		31°-60°	±0.3°
10-50	±0.10	±0.15	±0.20		61°-90°	±0.5°
50-100	±0.15	±0.20	±0.25			
100-	±0.15%	±0.20%	±0.25%			

Unit: mm

ENVIRONMENTAL

OPERATING

Operating Temperature: 0 to 50 °C (32 to 122 °F)
Relative Humidity: 5-90% (non-condensing)

STORAGE

Temperature: -40 to 80 °C (-40 to 176 °F)
Relative Humidity: 5-95% (non-condensing)

FCC Statement

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures.

Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2PC.

This device is restricted for indoor use.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

IMPORTANT NOTE:
This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.
Additional testing and certification may be necessary when multiple modules are used.
20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.
USERS MANUAL OF THE END PRODUCT:
In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC
radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.
The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.
If the labelling area is small than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:
The final end product must be labeled in a visible area with the following " Contains TX FCC ID: 2AIBX-NIU5L ".
If the labelling area is larger than the palm of the hand, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

IC Statement

This device complies with Industry Canada’s licence-exempt RSSs. Operation is subject to the following two conditions:
(1) This device may not cause interference; and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil

ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures.
Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without reassessment permissive change.
Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

This radio transmitter (21700-NIU5L) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
Le présent émetteur radio (21700-NIU5L) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz, 5470-5600 MHz and 5650-5725 MHz.
Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz.

The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.
les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une
utilisation à l’intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

The maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit.
le gain maximal d’antenne permis pour les dispositifs utilisant les bandes 5250-5350 MHz et 5470-5725 MHz doit se conformer à la limite de p.i.r.e.

The maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate.
le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5850 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

For indoor use only.
Pour une utilisation en intérieur uniquement.

IMPORTANT NOTE:
IC Radiation Exposure Statement:
This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

IMPORTANT NOTE:
This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.
Additional testing and certification may be necessary when multiple modules are used.
20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the IC RSS-102 radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:
In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains IC: 21700-NIU5L ".

The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.